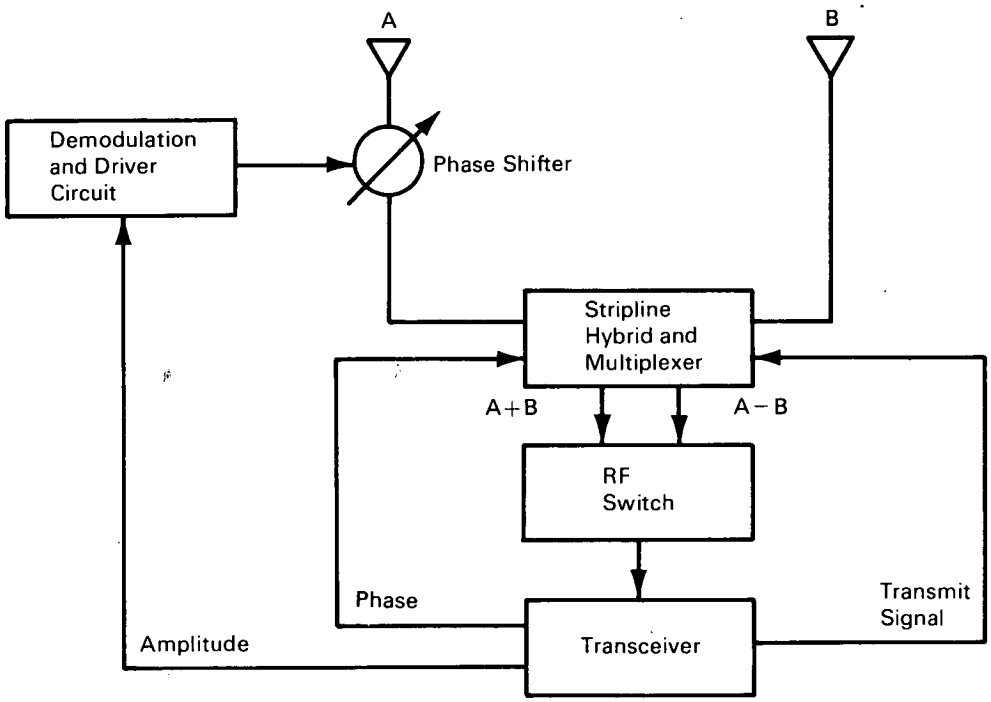
December 1970 Brief 70-10095

NASA TECH BRIEF

Antenna-Array, Phase Quadrature Tracking System



An antenna-array, phase-quadrature tracking system automatically adjusts the phase relationship between the input signals appearing on two widely-spaced parallel-connected antenna elements in the array. An optimum signal is delivered to a transceiver in the control system when a quadrature-phase relationship is achieved between the two input signals.

In the basic system, shown in the figure, the two input signals in a single array are combined to form the absolute sum and difference values of the signals. The sum and difference signals are then time-multiplexed through an rf switch at 10 millisecond intervals and processed to form a single multiplexed output which is applied to an amplitude detector in the receiver. The detector senses amplitude variations in the multiplexed signal and generates an output control voltage proportional to the deviation from the ideal quadrature phase condition. The control voltage is applied to a feedback loop in a variable phase shifter circuit that automatically adjusts the relative phase of the two antenna signals until amplitude modulation ceases in the multiplexed signal; i.e., until the two antenna signals are locked in phase quadrature. The control loop continuously adjusts the relative phase of the two antenna signals to maintain the optimized signal input condition.

(continued overleaf)

The rf switching operating in the multiplexing stage creates a phase modulation of the two input signals which is dependent upon the relative amplitude of the signals received on each of the antenna elements. The signal combining and multiplexing operations, including the rf switching, are accomplished by means of a stripline hybrid circuit which reduces the number of components in the antenna system.

When the antenna tracking system operates in the transmitting mode, power is delivered to the antenna element which will provide the maximum gain between the transmitting array and the receiving station. An example of this application is a communications link between an airport terminal and a commercial aircraft. The automatic selection of the antenna element with the proper phase relation provides a substantially omnidirectional antenna coverage with a minimum number of antenna elements. The complete system is lightweight and sufficiently compact to permit its use in a wide variety of airborne communications networks.

Note:

Requests for further information may be directed to:

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Reference: TSP70-10095

Patent status:

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